

## **An Annotated Review of Tritrophic Associations of Aphid Parasitoids (Hymenoptera, Braconidae, Aphidiinae) in Korea**

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**Abstract** As a first step toward a more comprehensive research on the taxonomy of Korean aphidiine species which are parasitic on the aphids, all the available records on their hosts and collecting data were reviewed. A list of 62 species is arranged according to the generic and then specific names alphabetically with hosts records and the host-parasitoid relationships were presented.

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**Key words** Aphidiinae, Braconidae, host, parasitoid, Korea

### **INTRODUCTION**

Aphid pest problems and the need for more environment-friendly control measures have stimulated research activities on their natural enemies, including the parasitoids, in many parts of the world. Though good results have been achieved in some control programs, overall research on the group is still needed because of the lacks of the fundamental informations, especially in Korea. Search for potentially available biological agents is the first and the most important step in the process of the biological control. The Aphidiinae are specific parasitoids of aphids, and they are one of the subfamilies of Braconidae, Ichneumonoidea. But their taxonomic status is not studied well as a family or a subfamily level. Therefore, Aphidiinae and Aphidiidae are mixed up. In spite of the unique geographic position of Korea, the insect fauna of the country is not studied well, especially on the natural enemies. Though "Checklist of Insects from Korea" is enumerated all species of the group, most records of aphidiine species were cited from occasional papers and the members of this taxon are almost ignored even in a survey on the fauna of a certain area. Moreover, host relationship is not adjusted, though it is very important character for a parasitoid. Therefore the authors tried to check all the available informations on the Korean aphidiine species, and to serve a fundamental step for finding useful biological control agents in Korea. Relatively little is known about the Aphidiinae from the Far East of the Russian federation (Starý, 1965; Kiriac,

1979). The information from the coastal areas of China is almost none, except for those from Hong Kong (Starý & Schlinger, 1967) and Taiwan (Chou, 1981, 1984; Liu, 1975). Possible migration routes of aphid parasitoids across the East China Sea in relation to Japan were dealt with by Mochida & Takada (1978). However, most informations come from Japan (see Takada, 1968, and a set of his papers with joint-authors; Starý, 1975; Yamauchi & Takada, 1978). A number of Korean records indicate that, in spite of only a small number of species determined, the faunal relationships would be rather wider, after carrying out a broad-scale research. Some preliminary analyses of the zoogeographical classification and faunal relationships of the Korean aphidiines were done by Starý (1970), Starý & Schlinger (1967), and Paik (1975). As far as we know, the first evidence on the taxon was on the matter of a parthenogenetic population of *Ephedrus persicae* by Schlinger & Hall (1960). Starý (1965) presented a general information on several species in South Korea within a framework of an overall study on the parasitoids of the former U.S.S.R. (Far East). Starý & Schlinger (1967) published a book on the Far East Asian Aphidiidae, including a considerable information from South Korea as well; keys to the genera and species are involved. Some general informations were found in the world list of the Aphidiidae (Mackauer & Starý 1967), and in the world catalogue (Mackauer 1968). Starý (1975) summarized the information on the Far East Asian Aphidiidae, including those of the Korean peninsula. Paik (1975, 1976) published the first papers pertaining solely to the aphidiids of Korea, including the keys and redescriptions of the known species. Takada (1976, 1979) elaborated the collections taken by the expeditions of the Hungarian National Museum to North Korea. The relatively recent information on the aphidiids came from Chang & Youn (1983a) and Chang, Lee & Youn (1994) and it covered the aphidiid guild associated with *Aphis glycines* and *A. craccivora*. Some general evidence on some species are also involved in the review of parasitoid biocontrol agents of virus vectors on papaya and citrus (Takada, 1992).

The overall information on the Korean aphidiines can be divided into following four groups: 1) Occasional reference on some parasitoid species: Schlinger & Hall (1960), Starý (1965), Takada (1992), Kiriac (1993); 2) Biosystematic studies at various levels, based on swept and/or reared material: Star & Schlinger (1967), Starý (1975), Paik (1975, 1976), Takada (1976, 1979); 3) World information: Mackauer & Starý (1967), Mackauer (1968); 4) Parasitoid guilds on individual pest aphid species: Chang & Youn (1983a, 1983b, 1986), Chang *et al.* (1994).

Analyses of individual papers showed a mixture of variable qualities from obvious errors to useful informations. A part of the errors came out from the historical development of researches. On the other hand, there are errors obviously due to a poor knowledge on the group. Namely, the geographical position of Korea and research knowledge on the taxon in the Far East area have played an important role. In the former records of Korean aphidiines, European species, East Palaearctic to Oriental species, even Nearctic faunal elements were mixed together. In general, such a confusion may be presumed but it is questionable whether the species is truly conspecific or seems to fit to the descriptions, often unclear or incomplete. Commonly, this feature is obvious from the taxonomic status and/or host of a parasitoid species, or both. The authors, therefore, have tried to add some notes on the aforementioned problems in the list of parasitoids.

In the list, the species were arranged alphabetically and followed by host aphids with its record, and

plant if available. Abbreviations used: NK – North Korea (Democratic People's Republic of Korea); SK – South Korea (Republic of Korea); QR – Questionable record; ER – Obviously erroneous record.

## MATERIAL AND METHODS

All the informations on the Korean aphidiids were gathered from the records and specimens as much as possible. Aphid nomenclature followed Eastop & Hille Ris Lambers (1976) and Remaudière & Remaudière (1997). The authors tried to indicate the collected localities accurately. The localities, therefore, were written as in the references, and, in some cases, present localities followed the rule for "Romanize Korean" were added in parenthesis.

## LIST OF SPECIES

### Genus *Adialytus* Förster

#### *Adialytus salicaphis* (Fitch)

*Aphis craccivora* Koch: [ER] [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Chaitophorus matsumurai* Hille Ris Lambers: [SK] Seoul, V-61, on *Salix* sp. (Starý & Schlinger, 1967).

*Chaitophorus populeti coreanus* Okamoto et Takahashi: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Chaitophorus saliniger* Shinji: [SK] the vicinity of Daejeon and Mt. Gyeryong, (Chang & Youn, 1983b, written as *C. chinensis* Takahashi).

Unknown host: [SK] (Starý, 1965)

Note: This species was commonly placed under *Lysiphlebus*. Chang and Youn (1983a) incorrectly indicated this as new to Korea.

### Genus *Aphidius* Nees

#### *Aphidius absinthii* Marshall

*Macrosiphoniella formosartemisiae* Takahashi: SK-Seoul, 9-V-61, on *Artemisia manischmidtiana* (Starý & Schlinger, 1967).

*Macrosiphoniella sanborni* (Gillette): [SK] Seoul, 9-V-61, on *Chrysanthemum* sp. (Star & Schlinger, 1967).

*Macrosiphoniella yomogifoliae* (Shinji): [SK] Seoul, 9-V-61, on *Artemisia manischmidtiana* (Star & Schlinger, 1967).

*Myzus persicae* (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Unknown hosts: [NK] Pyongyang (= Pyeongyang), hotel garden, prov. S. Pyongan (= Pyeongan-nam-do), 6-7-IX-71 (Takada, 1976); Botanical garden, Pyongyang (= Pyeongyang), prov. S. Pyongan (= Pyeongan-nam-do) 3-VIII-75; Za-mo san (= Mt. Jamosan), 60 km NE from Pyongyang (= Pyeongyang)

Bek-sung-li (= ?Baegjog-ri), prov. Pyong-sung (= ?Pyeong-seong in Pyeongannam-do) 1-10-VIII-75 (Takada, 1979). [SK] (Starý, 1965).

***Aphidius coloratus* Baker [ER]**

*Macrosiphoniella* spp.: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, and the record of Korea is maybe due to a misidentification.

***Aphidius ervi* Haliday**

Unknown hosts: [SK] Milyang, 10-VI-75 (Paik, 1976).

***Aphidius gifuensis* Ashmead**

*Aphis glycines* Matsumura: [SK] (Paik, 1975).

*Aphis gossypii* Glover: [SK] (Paik, 1975).

*Aulacorthum solani* (Kaltenbach): [SK] (Paik, 1975).

*Aulacorthum* sp.: [SK] (Paik, 1975).

*Macrosiphoniella pseudoartemisiae* Shinji: [SK] (Paik, 1975).

*Macrosiphoniella sanborni* (Gillette): [SK] (Paik, 1975).

*Myzus persicae* (Sulzer): [SK] Cheju-do Isl. (= Isl. Jejudo), 6-V-61, on *Malva* sp.; ditto, 5-V-61, on *Citrus sinensis* (Starý & Schlinger, 1967); Suweon, Kwangneung (= Gwangleung) (Paik, 1975).

***Aphidius longipetiolus* Takada [QR]**

*Acyrtosiphon pisum* (Harris): [SK] Pyungtaek (= Pyeongtaeg), 30-IV-75, on *Medicago sativa* (Paik, 1976).

*Macrosiphoniella pseudoartemisiae* Shinji: [SK] Kwangneung (= Gwangleung), 29-V-75, on *Artemisia* sp. (Paik, 1976).

Note: The species status of *A. absinthii*, *A. longipetiolus* and other similar species in the Far East is needed to be verified in details.

***Aphidius pisivorus* Smith [ER]**

*Aphis pisi* (Harris): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Macrosiphoniella yomogifoliae* (Shinji): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Myzus persicae* (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Note: This is a Nearctic species, and the record of this species in Korea is probably due to a misidentification.

***Aphidius ribis* Haliday**

*Cryptomyzus taoi* Hille Ris Lambers: [SK] Suweon, 5-VI-75, on *Ribes fasciculatum chinense* (Paik, 1976).

***Aphidius salicis* Haliday**

*Cavariella salicicola* (Matsumura): [SK] Seoul, 9-V-61, on *Salix* sp. (Starý & Schlinger, 1967).

***Aphidius urticae* Haliday**

*Macrosiphum corylicola* (Shinji): [SK] Suweon, 25-V-75, on *Corylus heterophylla japonica*; Seoul, 23-VI-75, on *Corylus heterophylla japonica* (Paik, 1976).

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1600 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 25-VIII-71 (Takada, 1976).

Note: A species complex may be involved in this nominal species.

***Aphidius* sp.**

*Macrosiphum rosae* Linne: [SK] Seoul, 15-V-61, on *Rosa* sp. (Starý & Schlinger, 1967).

**Genus *Areopraon* Mackauer*****Areopraon* sp.**

Unknown host: [NK] Lyong-Ak San (= Mt. Yongagsan), 14km W from Pyongyang (= Pyeong-yang), prov. S. Pyongan (= Pyeongannam-do), 11-VIII-71 (Takada, 1976).

***Areopraon* sp.**

"*A. sp.*" was erroneously listed (Starý & Schlinger, 1976) as a parasitoid of *Periphyllus* sp., instead of *Praon* sp. (Starý, 1975b).

**Genus *Betuloxys* Mackauer*****Betuloxys* sp.**

*Tuberculatus querciformosanus* (Takahashi): [SK] Seoul, 24-V-75, on *Quercus crispula* (Paik, 1976).

*Tuberculatus stigmatus* (Matsumura): [SK] Mt. Gyeryong, 3-VI-75, on *Quercus dentata* (Paik, 1976).

**Genus *Binodoxys* Mackauer*****Binodoxys communis* (Gahan)**

*Aphis gossypii* Glover: [SK] Suweon, 13-V-75, on *Rubia akane* (Paik, 1976).

***Binodoxys indicus* Subba Rao**

*Aphis gossypii* Glover: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Chaitophorus populeti coreanus* Okamoto et Takahashi: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Macrosiphum euphorbiae* (Thomas): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

***Binodoxys nearctaphidis* Mackauer [ER]**

*Aphis craccivora* Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Myzus persicae* (Sulzer): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, a parasite of *Roepkea bakeri* Cowen in the eastern U.S. (see Mackauer & Starý, 1967), and is recorded in Korea, maybe due to a misidentification.

***Binodoxys odinae* Paik**

*Toxoptera odinae* (van der Goot): [SK] Mt. Gyeryong, 18-VI-75, on *Rhus javanica*, holotype ♀, paratypes (Paik, 1976).

***Binodoxys orientalis* (Starý & Schlinger)**

*Sitobion ibarae* (Matsumura): [SK] Cheju-do Isl. (= Isl. Jeju-do), 6-V-61, on *Rosa* sp., paratypes (Starý & Schlinger, 1967).

***Binodoxys* sp.**

Unknown hosts: [NK] Go-Song Chon, upper reaches of brook below hotel, Kumgang San (= Mt. Geumgangsan), prov. Kanwon (= Gangwon-do), 30-V-70 (Takada, 1976).

**Genus *Boreogalba* Mackauer*****Boreogalba gladifer* Mackauer [ER]**

*Aulacorthum solani* (Kaltenbach): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Macrosiphoniella yomogifoliae* (Shinji): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, and the Korean record is probably due to a misidentification.

**Genus *Diaeretiella* Starý*****Diaeretiella rapae* (M<sup>c</sup>Intosh)**

*Brevicoryne brassicae* (Linne): [SK] (Paik, 1975).

*Lipaphis erysimi* (Kaltenbach): [SK] (Paik, 1975).

*Myzus persicae* (Sulzer): [SK] (Paik, 1975); the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

Unknown hosts: [NK] San-Gan Po, 30 Km N from Pyongyang (= Pyeongyang), prov. S. Phenan (= Pyeongannam-do), 24-V-70 (Takada, 1976).

### Genus *Diaeretus* Förster

#### *Diaeretus leucopterus* (Haliday)

*Eulachnus thunbergii* (Wilson): [SK] Seoul, 3-V-61, on *Pinus* sp. (Starý & Schlinger, 1967)

Unknown hosts: [SK] (Starý, 1965).

### Genus *Ephedrus* Haliday

#### *Ephedrus californicus* Baker [ER]

*Macrosiphum euphorbiae* (Thomas): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Uroleucon formosanum* (Takahashi): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: This is a Nearctic species, and the record of this species in Korea is probably due to a misidentification.

#### *Ephedrus nacheri* Quilis

*Cryptosiphum artemisiae* Buckton: [SK] (Paik, 1975).

*Hyalopterus pruni* (Geoffroy): [SK] (Paik, 1975).

#### *Ephedrus niger* Gautier, Bonnamour and Gaumont (= *Ephedrus campestris* Starý)

*Macrosiphoniella sanborni* (Gillette): [SK] Seoul, 9-V-61, on *Chrysanthemum* sp. (Starý & Schlinger, 1967).

*Macrosiphoniella yomogifoliae* (Shinji): [SK] Seoul, 9-V-61, on *Artemisia manschmidtiana* (Starý & Schlinger, 1967).

*Megoura viciae* Buckton: [SK] Seoul, 9-V-61, on *Vicia* sp. (Starý & Schlinger, 1967).

#### *Ephedrus persicae* Froggatt

*Aphis glycines* Matsumura: [SK] Taejeon (= Daejeon), V-IX-87 (Chang *et al.*, 1994).

*Aphis gossypii* Glover: [SK] (Schlinger & Hall, 1960); Cheju-do Isl. (= Isl. Jeju-do), 6-V-61 (Starý & Schlinger, 1967).

*Brachycaudus* sp.: [SK] (Paik, 1975).

*Myzus malisuctus* Matsumura: [SK] (Paik, 1975).

*Myzus persicae* (Sulzer): [SK] Cheju-do Isl. (= Isl. Jeju-do), 6-V-61, on *Prunus* sp. (Starý & Schlinger, 1967); the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

*Sitobion avenae* (Fabricius): [SK] (Paik, 1975).

*Tuberocephalus momonis* (Matsumura): [SK] (Paik, 1975).

***Ephedrus plagiator* (Nees)**

*Amphicercidus japonicus* (Hori): [SK] Seoul, 9-V-61, on *Lonicera* sp. (Starý & Schlinger, 1967).

*Aphis glycines* Matsumura: [SK] Taejon (= Daejeon), V-IX-87 (Chang *et al.*, 1994).

*Aphis gossypii* Glover: [SK] (Paik, 1975).

*Aphis* spp.: [SK] Seoul, 9-V-61, on *Prunus* sp. (Starý & Schlinger, 1967); (Paik, 1975).

*Cryptosiphum artemisiae* Buckton: [SK] (Paik, 1975).

*Myzus malisuctus* Matsumura: [SK] (Paik, 1975).

*Phorodon humuli japonensis* Takahashi: [SK] (Paik, 1975).

*Rhopalomyzus* sp.: [SK] (Paik, 1975).

*Sitobion ibarae* (Matsumura): [SK] (Paik, 1975).

*Uroleucon gobonis* (Matsumura): [SK] (Paik, 1975).

Unknown hosts: [NK] San-Chon Tong, about 20 Km SE from Kaesong (= Gaeseong), Bagyon San (= Mt. Bagyeonsan), prov. Kengi (= Gyeonggi-do), 8-VI-70; Sam-Zi-Yan (= Samjiyeon), 1600 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-gang (= Yanggang-do), 28-VIII-71 (Takada, 1976); Plateau Chann-Pay (= Jangbaeg), 24 Km NW from Sam-Zi-Yan (= Samjiyeon), prov. Ryang-Gang (Yanggang-do), 24-VIII-75 (Takada, 1979).

***Ephedrus* spp.**

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1500 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 24-VIII-71 (Takada, 1976).

**Genus *Euaphidius* Mackauer*****Euaphidius areolatus* Ashmead**

*Macrosiphoniella pseudoartemisiae* Shinji: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Periphyllus* spp.: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

***Euaphidius cingulatus* (Ruthe)**

*Aphis glycines* Matsumura: [QR] [SK] Taejon (= Daejeon), V-IX-87 (Chang *et al.*, 1994).

*Macrosiphoniella yomogifoliae* (Shinji): [QR] [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Myzus persicae* (Sulzer): [QR] [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

*Pterocomma* spp.: [SK] the vicinity of Daejeon & Mt. Gyeryong (Chang & Youn, 1983b).

Note: This species is a specific parasite of *Pterocomma*-aphids, but almost all the former records are from another hosts. It is, therefore, needed to be verified again.



### Genus *Fissicaudus* Starý and Schlinger

#### *Fissicaudus* sp. (as *Binodoxys*)

*Greenidea nipponica* Suenaga: [SK] Suweon, 19-VI-75, on *Quercus* sp. (Paik, 1976).

### Genus *Lipolexis* Förster

#### *Lipolexis gracilis* Förster

*Aphis glycines* Matsumura: [SK] (Paik, 1975).

*Aphis spiraeicola* Patch: [SK] (Paik, 1975).

Unknown hosts: [NK] Mang-Young-Dae (= Mangyeongdae), prov. S. Pyongan (= Pyeongannam-do), 5-VIII-71; Pyongyan (= Pyeongyang), hotel garden, prov. S. Pyongan (= Pyeongannam-do), 31-VIII-71; ditto, 6-7-IX-71; Pyongyan (= Pyeongyang), city park, prov. S. Pyongan (= Pyeongannam-do), 1-IX-71 (Takada, 1976).

#### *Lipolexis scutellaris* Mackauer

*Aphis craccivora* Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

### Genus *Lysaphidus* Smith

#### *Lysaphidus pleotrichophori* Takada

*Pleotrichophorus glandulosus* (Kalt.): [SK] Suweon, 10-VII-75, on *Artemisia* sp. (Paik, 1976).

### Genus *Lysephedrus* Starý

#### *Lysephedrus validus* (Haliday)

*Eriosomatine aphids*: [SK] Seoul, 9-V-61, on *Apium* sp., roots (Starý & Schlinger, 1967).

*Myzus persicae* (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

### Genus *Lysiphlebia* Starý and Schlinger

#### *Lysiphlebia japonica* (Ashmead)

*Aphis craccivora* Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a).

*Aphis gossypii* Glover: [SK] (Paik, 1975).

*Aphis ichigo* Shinji: [SK] (Paik, 1975).

*Aphis sambuci* Linne: [SK] Seoul, 9-V-61, on *Sambucus* sp. (Starý & Schlinger, 1967).

*Aphis spiraeicola* Patch: [SK] Cheju-do Isl. (= Isl. Jeju-do), 7-V-61, on *Citrus sinensis*; Seoul, 9-V-61,

- on *Crataegus pinnatifida*; Seoul, 9-V-61, on *Spiraea* sp. (Starý & Schlinger, 1967).  
*Aphis* sp.: [SK] Seoul, 9-V-61, on *Sanguisorba officinalis*, (Starý & Schlinger, 1967).  
*Aulacorthum solani* (Kaltenbach): [SK] (Paik, 1975).  
*Melanaphis sacchari* (Zehntner): [SK] (Paik, 1975).  
*Melanaphis* sp.: [SK] (Paik, 1975).  
*Myzus persicae* (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).  
*Tetraneura* sp.: [SK] Seoul, 9-V-61, on *Ulmus* sp. (Starý & Schlinger, 1967).  
*Toxoptera odinae* (van der Goot): [SK] (Paik, 1975).  
 Unknown hosts: [NK] Mang-Young-Dae (= Mangyeongdae), prov. S. Pyongan (= Pyeongannam-do), 5-VIII-71 (Takada, 1976).  
 Note: This species has been commonly listed under *Lysiphlebus*.

### ***Lysiphlebia rugosa* Starý and Schlinger**

- Aphis craccivora* Koch: [SK] (Paik, 1975)  
*Aphis* sp.: [SK] Seoul, 9-V-61, on *Sanguisorba officinalis*, paratypes (Starý & Schlinger, 1967).

## **Genus *Lysiphlebus* Förster**

### ***Lysiphlebus ambiguus* (Haliday) [ER]**

- Aphis craccivora* Koch: [SK] Suweon, 19-V-70, on *Hemistepta lyrata* (Paik, 1976); the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a).  
 Note: Due to priority reasons, the true *L. ambiguus* (Hal.) is a West-Palearctic and Oriental species, a parasitoid of *Sipha*-aphids. This material probably belongs to *L. confusus* Tremblay and Eady group.

### ***Lysiphlebus* sp. aff. *delhiensis* Subba Rao and Sharma**

- Aphis* sp.: [SK] Seoul, 9-V-61, on *Sanguisorba officinalis* (Starý & Schlinger, 1967).  
*Myzus persicae* (Sulzer): [SK] the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).  
 Note: This is probably a species of *L. confusus* group.

### ***Lysiphlebus delhiensis* Subba Rao and Sharma [QR]**

- Aphis craccivora* Koch: [SK] (Paik, 1975).  
 Note: The species is known as an Oriental species of uncertain taxonomic status, but most probably belongs to *L. confusus* group.

## **Genus *Monoctonus* Haliday**

### ***Monoctonus similis* Starý and Schlinger**

- Myzus* spp.: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).  
*Sappaphis piri* Matsumura: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

***Monoctonus* sp.**

Unknown hosts: [NK] Mt. Pektusan (= Baegdusan), Mu-Du-bong (= Mudubong), 2100–2200 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 25–VII–75 (Takada, 1979).

**Genus *Pauesia* Quilis*****Pauesia abietis* (Marshall)**

*Cinara piniformosana* (Takahashi): [SK] Suweon, 24–V–74, on *Pinus densiflora* (Paik, 1976).

Unknown hosts: [NK] Si-Sung-Ho (= Sijungho (lake)), 50 km S of Wonsan (= Weonsan) seashore, prov. Kanwon (= Gangwon-do), 29–V–70 (Takada, 1976).

Note: The conspecificity of the West- and East-Palearctic material of *P. abietis* and similar species need to be verified.

***Pauesia infulata* (Haliday)**

*Cinara louisianensis* Boudreaux: [SK] Mt. Gyeryong, 16–VI–1975, on *Biota orientalis* (Paik, 1976).

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1700 m, plateau Chann-Pay (= Jangbaeg), prov. Ryang-Gang (= Yanggang-do), 24–VII–75 (Takada, 1979).

***Pauesia japonica* (Ashmead)**

*Lachnus tropicalis* (van der Goot): [SK] Suweon, 4–V–70, on *Castanea crenata* (Paik, 1976).

***Pauesia jezoensis* (Watanabe)**

*Cinara tujaphilina* (del Guercio): [SK] Seoul, 24–V–75, on *Sabina chinensis horizontalis* (Paik, 1976).

***Pauesia pini* (Haliday)**

*Cinara formosana* (Takahashi): [SK] Seoul, 25–V–75, on *Pinus koraiensis* (Paik, 1976).

Unknown hosts: [NK] Mt. Ze-Dong (= Jedongsan), Hyesan, Prov. Ryang-Gang (= Yanggang-do), 26–VII–75 (Takada, 1979).

***Pauesia salignae* (Watanabe)**

*Tuberolachnus salignus* (Gmelin): [NK] Vansan (= Weonsan), 11–IX–87 (Kiriak, 1993). [SK] (Paik, 1975).

Note: Paik (1975) described this as unrecorded species in Korea.

***Pauesia unilachni* (Gahan)**

*Lachnus* sp.: [SK] (Paik, 1975).

*Schizolachnus orientalis* (Takahashi): [SK] Seoul, 8–V–61, on *Pinus* sp. (Starý & Schlinger, 1967); (Paik, 1975).

Unknown hosts: [SK] (Starý, 1965).

***Pauesia* sp.**

Unknown hosts: [NK] Si-Sung Ho (= Sijungho (lake)), 50 km S of Wonsan (= Weonsan) seashore, prov. Kanwon (= Gangwon-do), 29-V-70 (Takada, 1976).

**Genus *Praon* Haliday*****Praon coreanum* Takada**

Unknown hosts: [NK] Plateau Chann-Pay (= Jangbaeg), 24 Km NW from Sam-Zi-Yan (= Samjiyeon), road to Mt. Pektusan (= Baegdusan), 2,000 m, prov. Ryang-Gang (= Yanggang-do), 24-VII-75; holotype ♀, Mt. Ze-dong (= Jedongsan), Hyesan, prov. Ryang-Gang (= Yanggang-do), 26-VII-75, paratype (Takada, 1979).

***Praon dorsale* (Haliday)**

*Macrosiphoniella* sp.: [SK] (Paik, 1975).

***Praon orientale* Starý and Schlinger**

*Aphis spiraecola* Patch: [SK] Seoul, 9-V-61, on *Crataegus pinnatifida*, paratypes (Starý & Schlinger, 1967).

*Cavariella* sp.: [SK] Cheju-do Isl. (= Isl. Jeju-do), 6-V-61, on *Rosa* sp., paratypes (Starý & Schlinger, 1967).

*Myzus persicae* (Sulzer): [SK] Cheju-do Isl. (= Isl. Jeju-do), 6-V-61. paratypes (Starý & Schlinger, 1967).

*Sitobion ibarae* (Matsumura): [SK] Cheju-do Isl. (= Isl. Jeju-do), 6-V-67, on *Rosa* sp., paratypes (Starý & Schlinger, 1967).

***Praon volucre* (Haliday)**

*Phorodon humuli japonensis* Takahashi: [SK] (Paik, 1975).

*Sitobion ibarae* (Matsumura): [SK] (Paik, 1975).

*Uroleucon formosanum* (Takahashi): [SK] (Paik, 1975).

***Praon yomenae* Takada**

Unknown hosts: [NK] Mts. Guk-San-Bong, 40 Km NE from Nam-Po (= Nampo), prov. S. Pyongan (= Pyeongannam-do), 5-IX-71 (Takada, 1976); Nam-Po (= Nampo), prov. S. Pyongan (= Pyeongannam-do), 19-VII-75 (Takada, 1979).

***Praon* spp.**

*Aphis gossypii* Glover: [SK] Cheju-do Isl. (= Isl. Jeju-do), 6-V-61 (Starý & Schlinger, 1967).

*Eulachnus thunbergii* (Wilson): [SK] Suweon, 10-VI-75, on *Pinus koraiensis*; Seoul, 24-V-75, on *Pinus koraiensis* (Paik, 1976).

*Periphyllus* sp.: [SK] (Starý & Schlinger, 1967; Starý, 1975b).

Unknown hosts: [NK] Sam-Zi-Yan (= Samjiyeon), 1500 m, plateau Chann-Pay (= Jangbaeg), prov.

Ryang-Gang (= Yanggang-do), 24-VIII-71 (Takada, 1976).

### **Genus *Trioxys* Haliday**

#### ***Trioxys asiaticus* Telenga [QR]**

*Acyrtosiphon gossypii* Mordvilko: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Aphis medicaginis* Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Macrosiphoniella yomogifoliae* (Shinji): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

Note: According to Mackauer and Starý (1967), this is mainly distributed near East and central Asia, Iran and U.S.S.R.

#### ***Trioxys curvicaudus* Mackauer**

*Tinocallis zekowae* (Takahashi): [SK] Seoul, on *Quercus* sp. (Paik, 1976).

#### ***Trioxys hokkaidensis* Takada**

*Aphis craccivora* Koch: [SK] the vicinity of Daejeon and Mt. Gyeryong, IV-IX-83, on Leguminosae (Chang & Youn, 1983a); the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

*Chaitophorus chinensis* Takahashi: [SK] the vicinity of Daejeon and Mt. Gyeryong, (Chang & Youn, 1983b).

*Myzus persicae* (Sulzer): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b); the vicinity of Daejeon, IV-X-85 (Chang & Youn, 1986).

*Tuberocephalus momonis* (Matsumura): [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

#### ***Trioxys japonicus* (Star and Schlinger)**

*Aphis gossypii* Glover: [SK] the vicinity of Daejeon and Mt. Gyeryong (Chang & Youn, 1983b).

#### ***Trioxys* spp.**

*Aphis craccivora* Koch: [SK] Suweon (Paik, 1975).

*Chaitophorus populeti* (Panzer): [SK] Suweon, 16-VI-70, on *Populus alba* (Paik, 1976).

*Tuberculatus* sp.: [SK] Suweon, 16-VI-75, on *Quercus* sp. (Paik, 1976).

Unknown hosts: [NK] Lyong-Ak San (= Mt. Yongagsan), 25 km W from Pyongyang (= Pyeongyang), prov. S. Pyongan (= Pyeongan-do), 31-VIII-71 (Takada, 1976).

## List of Host-Parasitoids

Host aphid	Parasitoid
<i>Acyrtosiphon gossypii</i> Mordvilko	<i>Trioxys asiaticus</i> Telenga [QR]
<i>Acyrtosiphon pisum</i> (Harris)	<i>Aphidius longipetiolus</i> Takada [QR]
<i>Amphicercidus japonicus</i> (Hori)	<i>Ephedrus plagiator</i> (Nees)
<i>Aphis craccivora</i> Koch	<i>Adialytus salicaphis</i> (Fitch)
	<i>Lipolexis scutellaris</i> Mackauer
	<i>Lysiphlebia japonica</i> (Ashmead)
	<i>Lysiphlebia rugosa</i> Starý & Schlinger
	<i>Lysiphlebus delhiensis</i> Subba Rao & Sharma [QR]
	<i>Trioxys hokkaidensis</i> Takada
	<i>Trioxys</i> spp.
<i>Aphis glycines</i> Matsumura	<i>Aphidius gifuensis</i> Ashmead
	<i>Ephedrus persicae</i> Froggatt
	<i>Ephedrus plagiator</i> (Nees)
	<i>Euaphidius cingulatus</i> (Ruthe) [QR]
	<i>Lipolexis gracilis</i> Förster
<i>Aphis gossypii</i> Glover	<i>Aphidius gifuensis</i> Ashmead
	<i>Binodoxys communis</i> (Gahan)
	<i>Binodoxys indicus</i> Subba Rao
	<i>Ephedrus persicae</i> Froggatt
	<i>Ephedrus plagiator</i> (Nees)
	<i>Lysiphlebia japonica</i> (Ashmead)
	<i>Praon</i> spp.
	<i>Trioxys japonicus</i> (Starý et Schlinger)
<i>Aphis ichigo</i> Shinji	<i>Lysiphlebia japonica</i> (Ashmead)
<i>Aphis medicaginis</i> Koch	<i>Trioxys asiaticus</i> Telenga [QR]
<i>Aphis sambuci</i> Linne	<i>Lysiphlebia japonica</i> (Ashmead)
<i>Aphis spiraeicola</i> Patch	<i>Lipolexis gracilis</i> Förster
	<i>Lysiphlebia japonica</i> (Ashmead)
	<i>Praon orientale</i> Starý & Schlinger
<i>Aphis</i> spp.	<i>Ephedrus plagiator</i> (Nees)
	<i>Lysiphlebia japonica</i> (Ashmead)
	<i>Lysiphlebia rugosa</i> Starý & Schlinger
	<i>Lysiphlebus</i> sp. aff. <i>delhiensis</i> S. Rao & Sharma
<i>Aulacorthum solani</i> (Kaltenbach)	<i>Aphidius gifuensis</i> Ashmead
	<i>Lysiphlebia japonica</i> (Ashmead)
<i>Aulacorthum</i> sp.	<i>Aphidius gifuensis</i> Ashmead
<i>Brachycaudus</i> sp.	<i>Ephedrus persicae</i> Froggatt
<i>Brevicoryne brassicae</i> (Linne)	<i>Diaeretiella rapae</i> (M <sup>c</sup> Intosh)
<i>Cavariella salicicola</i> (Matsumura)	<i>Aphidius salicis</i> Haliday
<i>Cavariella</i> sp.	<i>Praon orientale</i> Starý & Schlinger
<i>Chaitophorus chinensis</i> Takahashi	<i>Trioxys hokkaidensis</i> Takada
<i>Chaitophorus matsumurai</i> Hille Ris Lambers	<i>Adialytus salicaphis</i> (Fitch)
<i>Chaitophorus populeti</i> (Panzer)	<i>Adialytus salicaphis</i> (Fitch)
	<i>Binodoxys indicus</i> Subba Rao

Continued.

Host aphid	Parasitoid
	<i>Trioxys</i> spp.
<i>Chaitophorus saliniger</i> Shinji	<i>Adialytus salicaphis</i> (Fitch)
<i>Cinara formosana</i> (Takahashi)	<i>Pauesia pini</i> (Haliday)
<i>Cinara louisianensis</i> Boudreaux	<i>Pauesia infulata</i> (Haliday)
<i>Cinara piniformosana</i> (Takahashi)	<i>Pauesia abietis</i> (Marshall)
<i>Cinara tujaphilina</i> (del Guercio)	<i>Pauesia jezoensis</i> (Watanabe)
<i>Cryptomyzus taoi</i> Hille Ris Lambers	<i>Aphidius ribis</i> Haliday
<i>Cryptosiphum artemisiae</i> Buckton	<i>Ephedrus nacheri</i> Quilis <i>Ephedrus plagiator</i> (Nees)
Eriosomatinae spp.	<i>Lysephedrus validus</i> (Haliday)
<i>Eulachnus thunbergii</i> (Wilson)	<i>Diaeretus leucopterus</i> (Haliday) <i>Praon</i> spp.
<i>Greenidea nipponica</i> Suenaga	<i>Fissicaudus</i> sp.
<i>Hyalopterus pruni</i> (Geoffroy)	<i>Ephedrus nacheri</i> Quilis
<i>Lachnus tropicalis</i> (van der Goot)	<i>Pauesia japonica</i> (Ashmead)
<i>Lachnus</i> sp.	<i>Pauesia unilachni</i> (Gahan)
<i>Lipaphis erysimi</i> (Kaltenbach)	<i>Diaeretiella rapae</i> (McIntosh)
<i>Macrosiphoniella formosartemisiae</i> Takahashi	<i>Aphidius absinthii</i> Marshall
<i>Macrosiphoniella pseudoartemisiae</i> Shinji	<i>Aphidius gifuensis</i> Ashmead <i>Aphidius longipetiolus</i> Takada [QR] <i>Euaphidius areolatus</i> Ashmead
<i>Macrosiphoniella sanborni</i> (Gillette)	<i>Aphidius absinthii</i> Marshall <i>Aphidius gifuensis</i> Ashmead <i>Ephedrus niger</i> Gautier, Bonnamour & Gaumont
<i>Macrosiphoniella yomogifoliae</i> (Shinji)	<i>Aphidius absinthii</i> Marshall <i>Ephedrus niger</i> Gautier, Bonnamour & Gaumont <i>Euaphidius cingulatus</i> (Ruthe) [QR] <i>Trioxys asiaticus</i> Telenga [QR]
<i>Macrosiphoniella</i> sp.	<i>Praon dorsale</i> (Haliday)
<i>Macrosiphum corylicola</i> (Shinji)	<i>Aphidius urticae</i> Haliday
<i>Macrosiphum euphorbiae</i> (Thomas)	<i>Binodoxys indicus</i> Subba Rao
<i>Macrosiphum rosae</i> (Linne)	<i>Aphidius</i> sp.
<i>Megoura viciae</i> Buckton	<i>Ephedrus niger</i> Gautier, Bonnamour & Gaumont
<i>Melanaphis sacchari</i> (Zehntner)	<i>Lysiphlebia japonica</i> (Ashmead)
<i>Melanaphis</i> sp.	<i>Lysiphlebia japonica</i> (Ashmead)
<i>Myzus malisuctus</i> Matsumura	<i>Ephedrus persicae</i> Froggatt <i>Ephedrus plagiator</i> (Nees)
<i>Myzus persicae</i> (Sulzer)	<i>Aphidius absinthii</i> Marshall <i>Aphidius gifuensis</i> Ashmead <i>Diaeretiella rapae</i> (McIntosh)

Continued.

Host aphid	Parasitoid
	<i>Ephedrus persicae</i> Froggatt <i>Euaphidius cingulatus</i> (Ruthe) [QR] <i>Lysephedrus validus</i> (Haliday) <i>Lysiphlebia japonica</i> (Ashmead) <i>Lysiphlebus</i> sp. aff. <i>delhiensis</i> S. Rao & Sharma <i>Praon orientale</i> Starý & Schlinger <i>Trioxys hokkaidensis</i> Takada
<i>Myzus</i> spp.	<i>Monoctonus similis</i> Starý et Schlinger
<i>Periphyllus</i> sp.	<i>Euaphidius areolatus</i> Ashmead <i>Praon</i> spp.
<i>Phorodon humuli japonensis</i> Takahashi	<i>Ephedrus plagiator</i> (Nees) <i>Praon volucre</i> (Haliday)
<i>Pleotrichophorus glandulosus</i> (Kaltenbach)	<i>Lysaphidus pleotrichophori</i> Takada
<i>Pterocomma</i> spp.	<i>Euaphidius cingulatus</i> (Ruthe)
<i>Rhopalomyzus</i> sp.	<i>Ephedrus plagiator</i> (Nees)
<i>Sappahpis piri</i> Matsumura	<i>Monoctonus similis</i> Starý et Schlinger
<i>Schizolachnus orientalis</i> (Takahashi)	<i>Pauesia unilachni</i> (Gahan)
<i>Sitobion avenae</i> (Fabricius)	<i>Ephedrus persicae</i> Froggatt
<i>Sitobion ibarae</i> (Matsumura)	<i>Binodoxys orientalis</i> (Starý & Schlinger) <i>Ephedrus plagiator</i> (Nees) <i>Praon orientale</i> Starý & Schlinger <i>Praon volucre</i> (Haliday)
<i>Tetraneura</i> sp.	<i>Lysiphlebia japonica</i> (Ashmead)
<i>Tinocallis zelkowae</i> (Takahashi)	<i>Trioxys curvicaudus</i> Mackauer
<i>Toxoptera odinae</i> (van der Goot)	<i>Binodoxys odinae</i> Paik <i>Lysiphlebia japonica</i> (Ashmead)
<i>Tuberculatus querciformosanus</i> (Takahashi)	<i>Betuloxys</i> sp.
<i>Tuberculatus stigmatus</i> (Matsumura)	<i>Betuloxys</i> sp.
<i>Tuberculatus</i> sp.	<i>Trioxys</i> spp.
<i>Tuberocephalus momonis</i> (Matsumura)	<i>Ephedrus persicae</i> Froggatt <i>Trioxys hokkaidensis</i> Takada
<i>Tuberolachnus salignus</i> (Gmelin)	<i>Pauesia salignae</i> (Watanabe)
<i>Uroleucon formosanum</i> (Takahashi)	<i>Praon volucre</i> (Haliday)
<i>Uroleucon gobonis</i> (Matsumura)	<i>Ephedrus plagiator</i> (Nees)

### Corrections for “Check List of Insects from Korea”

A total of 41 aphidiine species are included in “Check List of Insects from Korea”. Though some species in this study are listed only by generic level, 62 species are recorded if we consider those species



as separated species. When comparing the result of this study with the species of the checklist, there is only one species, *Aphidius commodus*, not shared. The authors, however, presume it is most probably identical with *Aphidius absinthii*. There are many errors including typographic in the check list. Hereby errata are given.

<i>Diaeretiella rapae</i> (M'intosh)	→	<i>Diaeretiella rapae</i> (M <sup>e</sup> Intosh)
<i>Ephedrus</i> ( <i>Ephedrus</i> ) <i>persicae</i> Froggott	→	<i>Ephedrus</i> ( <i>Ephedrus</i> ) <i>persicae</i> Froggatt
<i>Ephedrus</i> ( <i>Ephedrus</i> ) <i>plagator</i> (Nees)	→	<i>Ephedrus</i> ( <i>Ephedrus</i> ) <i>plagiator</i> (Nees)
<b><i>Lysiphlebus</i></b> ( <i>Phlebus</i> ) <i>salicaphis</i> (Fitch)	→	<b><i>Adialytus</i></b> <i>salicaphis</i> (Fitch)
<i>Pauesia jezonensis</i> (Watanabe)	→	<i>Pauesia jezoensis</i> (Watanabe)
<i>Praon dosale</i> (Haliday)	→	<i>Praon dorsale</i> (Haliday)
<i>Trioxys</i> ( <i>Binoboxys</i> ) <i>communis</i> (Gahan)	→	<i>Trioxys</i> ( <i>Binodoxys</i> ) <i>communis</i> (Gahan)
<i>Trioxys</i> ( <i>Binoboxys</i> ) <i>nearactaphidis</i>	→	<i>Trioxys</i> ( <i>Binodoxys</i> ) <i>nearctaphidis</i>
<i>Trioxys</i> ( <i>Binoboxys</i> ) <i>odinae</i> Paik	→	<i>Trioxys</i> ( <i>Binodoxys</i> ) <i>odinae</i> Paik
<i>Trioxys</i> ( <i>Binoboxys</i> ) <i>orientalis</i>	→	<i>Trioxys</i> ( <i>Binodoxys</i> ) <i>orientalis</i>

## ACKNOWLEDGMENTS

Our research activities were supported by a cowork project between NIAST, Republic of Korea and the Institute of Entomology, Academy of Science of the Czech Republic. Cordial thanks are also expressed to Myung-Chul Hahm, the Ambassador of Korea in the Czech Republic for his kind interest and encouragement of the research-cowork in entomology.

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## 한국産 진딧물 기생봉 (벌目, 고치벌科, 진디벌亞科)의 기주 정리

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진딧물에 기생하는 한국산 진디벌에 관해서 국내외의 문헌기록을 중심으로 정리하여 10종의 학명은 잘못 사용되고 있음을 확인하였으며, 재정리한 결과 한국곤충명집에서 41종이었던 진디벌은 총 62종으로 확인되었다. 이들을 속과 종에 따라 알파벳 순으로 정리한 뒤, 각 종에 대해 기주 진딧물을 명시하였고 가능한 경우 기주가 채집된 식물도 정리하였으며, 기주 진딧물별로 기생하는 진디벌을 배열하였다.

검색어 : 진디벌아과, 고치벌과, 기주, 한국, 기생봉

(Received : August 25, 1999)

(Accepted : February 23, 2000)